Biology 414 ELL
ELL Biology Curriculum
Summit High School
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Overview:

Sheltered ELL Biology establishes the core understandings necessary to succeed in subsequent science courses in conjunction with developing content-specific English language proficiency. Sheltered ELL Biology exposes English Language Learners to specific content vocabulary and syntax along with essential critical and scientific thinking skills. The course will enhance students' linguistic and academic confidence when studying and exploring concepts relating to biology and life. The units cover core understandings in ecology, evolution, cytology, genetics, and biodiversity with the aid of visuals, graphic organizers, scaffolds, real-life application, and differentiation. This sheltered course is designed to reach varying academic and linguistics levels by connecting scientific concepts to relevant real-life situations. The course is aligned with the New Jersey Student Learning Standards for Science (Science NJSLS) and the WIDA English Language Development Standard 4 (Language of Science).

Unit 1: Intro to Science and Ecology



Step 1: Identify Standards and Anchoring Phenomenon Connections

Grade and Subject	Grades 9-12 Sheltered ELL Biology	**Unit Instructional Time**	~ 6 weeks
Unit Title (Topic)	Ecology: Chapter 3: Biosphere, Chapter 4: Ecosystems and Communities Chapter 5: Populations, Chapter 6: Humans in the Biosphere		

1.a Select grade level NGSS/NJSLS Performance Expectations (PEs) or Topics, or district/state standards that build towards unit-based student learning goals.
For NGSS, PE color coding reflects 3-dimensional learning components. Search the Evidence Statements for details on what students should know and do.

HS-LS2: Ecosystems: Interactions, Energy, and Dynamics
HS-ESS3: Earth and Human Activities
HS-ESS2: Earth's Systems

HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect the carrying capacity of ecosystems at different scales.
HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic conditions.
HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
HS-ESS3-5. Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.
HS-ESS2-6. Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

1.b Identify an anchoring phenomenon and related phenomena, problem, or project that corresponds to the selected PEs/standards, and is engaging and relevant to students. See more about phenomena and using phenomena with NGSS.

Phenomena: Our Planet or observations outside - how do different types of life interact with each other?
Problem: Invasive Species, how do we stop them?

1.c Describe an overview of how investigating the anchoring and related phenomenon, problem, or project through student-driven learning opportunities builds towards understanding of the PEs/standards. Revise, as needed, during unit development.

How do different forms of life interact and rely on one another? As students work and complete the various activities and assignments in this unit they will gain knowledge on the interdependence of organisms in a system. They will use the laws of physics to understand how material is continuously cycled through systems while energy input from the sun is transferred (and lost) as it moves through. In addition to the direct relationships between topics and the phenomena, students will also complete assignments that address the ideas of ecosystem changes as well as population.
How can we reduce the impact of invasive species? As we investigate invasive species students learn how they impact/ alter interactions, food chains/webs, cycling of matter and ecosystems. Students can also see how these organisms impact populations. Invasive species can be a starting point to dive deeper into human involvement and impact. (Pollution and Climate Change, Overhunting and resource depletion as well as conservation practices). Ultimately using the knowledge obtained to answer the question of how we can reduce the impact of invasive species.

1.d Unpack the 3-D learning components of the Performance Expectations/standards in the table below.
For NGSS guidance, see the NGSS Topic Arrangements and NGSS DCI Arrangements. Use tools to unpack each PE separately.

1.d.1. Science and Engineering Practices (SEP) (skills)	**1.d.2. Disciplinary Core Ideas (DCI) (content)**	**1.d.3. Crosscutting Concepts (CCC) (connections)**
Constructing Explanations and Designing Solutions Analyzing and Interpreting Data	LS1.A: Structure and Function LS1.C: Organization for Matter and Energy Flow in Organisms LS2.A: Interdependent Relationships in Ecosystems LS2.B: Cycling of Matter and Energy Flow in Ecosystems LS2.C: Ecosystem Dynamics, Functioning, and Resilience LS2.D: Social Interactions and Group Behavior LS4.C: Adaptation LS4.D: Biodiversity and Humans PS3.D: Energy in Chemical Processes ETS1.B: Developing Possible Solutions ESS3.C: Human Impacts on Earth Systems ESS3.D: Global Climate Change	Scale, Proportions and Quantity Cause and Effect Systems and System Models Energy and Matter Stability and Change Structure and Function Influence of Science, Engineering and Technology on Society and the Natural World

1.e Determine students' prior knowledge about the lesson concepts. (e.g., pre-test, class discussion, exit ticket, 1-minute report, KWL chart, survey, etc.)

Students should have previous knowledge of ecology from middle school science (food chains, energy transfer, nutrient cycles). To better gauge where students are teachers can assign any combination of the following:

- 1-minute report on Ecology (to be tailored to unit) (can also be turned into a GoogleForm)
- Ecology KWL homework assignment.

1.f Choose an instructional strategy that best suits teaching and learning about the anchoring phenomena, problem, or project.
For ideas, see the Instructional Strategies matrix.

Phenomena based and problem based.

1.g Generate goals for a summative assessment to measure student learning toward the identified PEs and supporting SEPs, DCIs, and CCCs or standards and supporting skills, content, and connections. Revise, as needed, during unit development.

- Describe the goals of science.
- Explain the procedures at the core of scientific methodology.
- Explain the relationship between science and society.
- Describe the crosscutting concepts (big ideas) of biology.
- Define ecology and explain its importance.
- Differentiate between biotic and abiotic components .
- Explain how we can understand global systems and the changes they undergo.
- Differentiate between weather and climate.
- Describe how Earth's climate and average temperature are determined.
- Identify the factors that shape regional climates.
- Explain the processes involved in climate change.
- Define primary producers.
- Describe how consumers obtain energy and nutrients.
- Explain how energy flows through ecosystems.
- Explain how ecological pyramids help analyze energy flow through trophic levels.
- Explain how water cycles globally.
- Identify the subatomic particles of an atom and their roles.
- Identify hydrogen bonds and covalent bonds
- Explain how the structure of water leads to its special properties.
- Explain how water's polarity affects the way water interacts with other substances.
- Explain how competition, herbivory, and keystone species all shape communities.
- Identify factors are used to characterize biomes.
- Identify the factors that affect population growth.
- Describe the change in human population size over time and explain why population growth rates vary between countries.
- Identify the types of (and the benefits of) biodiversity.
- Explain some important ecosystem services.
- Explain how human activities change the atmosphere and climate.
- Identify the various types of pollution and their impact on ecosystems and climate.
- Explain why biodiversity is important and how humans are threatening biodiversity.
- Examine evidence that supports the claims that the climate is changing.

- Explain the role of science in responding to climate change.
- Identify the criteria that can be used to evaluate whether development is sustainable.

Unit 1: Ecology	
Academic Vocabulary:	Academic Syntax:
Biology, Science, Hypothesis, Prediction, Procedure, Purpose, Observation, Experiment, Data, Conclusion, Analyze, Biotic, Abiotic, Ecology, Species, Organism, Environment, Habitat, Population, Community, Ecosystem, Biome, Biosphere, Energy, Energy Flow, Trophic Level, Autotroph, Heterotroph, Climate Change, Climate, Competition, Predation, Predator, Prey, Symbiosis, Commensalism, Mutualism, Parasitism, Parasite, Host, Invasive Species, Hydrogen, Oxygen, Covalent Bonds, Hydrogen Bonds, Atoms, Herbivore, Carnivore, Omnivore, Scavengers, Decomposers, Growth, Biodiversity, Producers, Consumers, Energy Pyramids, Food chain, Food web, Ecosystem, Sustainability, Public Service Announcement	"I wonder…/I am curious about…" "I observe…" "I think… because…" "My investigation is about…" "If…, then…" "I predict…" "My hypothesis was [correct/incorrect] because…" "My hypothesis is.." "My results are…" "Based on the evidence, I believe/predict/think…" "The data suggests…" "… was surprising because…" "At the end of the lab, I learned…" "First/Then/Next/After, I will…" "I can change my investigation by…" "The cause of… was…" "The effect of…was…" "I believe… affected…" "The purpose is to teach the audience about…" "The call-to-action is…" "The problem can be solved by…"

Unit Storyline

2.a List previous Performance Expectations/standards that support grade level expectations in figuring out the anchoring phenomenon.

HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
HS-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
HS-ESS3-5. Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.
HS-ESS2-6. Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

2.b Identify Unit Topics and Learning Goals: List main unit concepts related to grade level PEs/standards that support student learning goals in figuring out the anchoring phenomenon; revise as needed.

1. Biosphere
    a. What is Ecology?
    b. Energy, Producers, Consumers
    c. Energy flow in ecosystems
    d. Water Cycle
2. Ecosystems and Communities
    a. Climate
    b. Niche (function) and Community Interactions
    c. Biomes
3. Populations
    a. How populations grow
    b. Limits to population growth
4. Humans in the biosphere

a. Changing landscape
b. Using resources wisely
c. Biodiversity
d. Sustainability

2.c Select Unit Resources: Identify unit resources to develop lessons that address the PEs/standards and investigate the anchoring phenomenon through a variety of sequenced activities; revise as needed (include title and URL).

Building Bottle Terrariums (resource dependent)
Graphing activity of population size and carrying capacity/limiting factors (possible modification to biology candy lab)
Mini lab: Why do different Earth surfaces have different temperatures?
Wkst: Interpreting Climate graphs
Quick lab: Model energy flow in ecosystems
Energy Flow in Ecosystems wkst
pyramid modeling activity, directions ELL version, directions
Wolves of Yellowstone video Wolves of Yellowstone material (worksheets and such PBS Learning) (ALL AVAILABLE IN SPANISH AS WELL FOR ELL STUDENTS)
Build a food web (spanish version available) organisms for food web
limiting factors wkst
Warm Up to Biogeo cycles: H20 cycle
POGIL Succession
POGIL Properties of water (be sure to include visuals for students in this class to refer back to)
Playdough Atoms
POGIL Experimental Variables
Properties of water lab
succession worksheet
data analysis and succession
Graphing activity of population size and carrying capacity/limiting factors. (possible lab activity)
Trends in CO_2 data analysis
niche and community interactions wkst
symbiosis infographic
predator prey graphing and data interpretation: Impact of predator introduction
Surviving winter in the dust bowl (food chains and trophic interactions)
Public Service Announcement Project
Case studies on Human impact (atmospheric ozone, North Atlantic Fisheries, Climate change) pg 145-147 of Miller and Levine 2010.

Unit Storyline Template

The Storyline provides an overarching narrative and coherency between the series of lessons that comprise a unit. Copy and paste the Unit Storyline Template for each lesson in the unit. *A lesson may consist of one or more activities and take one or more days of instructional time.*

Driving Question… What we're investigating about the anchoring phenomenon	**Lesson Activities Sequence** (select from 2.c)	**Skills for Investigating the Driving Question (SEP)** (select from 1.d.1.)	**What We Figure Out About the Driving Question (DCI/CCC)** (select from 1.d.2 and 1.d.3.)	**New Questions & Next Steps** (build activity/lesson coherency)
1. What do I know about Biology and Science in general? 2. How can we think scientifically? 3. What is Ecology and important background information I need to know? 4. How does Earth, and all of its inhabitants survive without any inputs, other than energy from the sun? 5. How does Earth support life and why is there such variation? 6. How do energy and matter move through smaller systems? Is it recycled? 7. How does matter move through a system? Is it recycled? 8. How do populations grow, how are they connected to ecosystems? 9. How do populations interact within communities?	1. What is science discussion/activity 2. Whip around discussion: where have you lived/visited? How was the environment and life different/similar to NJ? 3. Our Planet Jungles. *RESOURCE DEPENDENT BUILD A TERRARIUM HERE WHICH WILL BE USED THROUGHOUT UNIT* 4. Mini lab: Why do different Earth surfaces have different temperatures? Lead into discussion of climate, weather, interpretation of graphs. Focus on scientific vocabulary 5. Draw a food web of biome of your choice - teacher model first. Then, turn it into a web, then finally trophic pyramid 6. Wolves of Yellowstone or create a food web activity, Keystone species. 7. Warm Up to Biogeo cycles: H20 cycle	1+2. HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. 4+7. HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. 4+5. HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. 5. HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. HS-ESS2-6. Develop a quantitative model to describe the cycling of	1. DCI LS1.A: Structure and Function LS1.C: Organization for Matter and Energy Flow in Organisms LS2.A: Interdependent Relationships in Ecosystems LS2.B: Cycling of Matter and Energy Flow in Ecosystems CCC Systems and System Models Energy and Matter Stability and Change Scale, Proportions and Quantity 2. DCI PS3.D: Energy in Chemical Processes ESS3.C: Human Impacts on Earth Systems LS1.C: Organization for Matter and Energy Flow in Organisms LS2.A:	1. How can Earth be self sustaining and how is it being altered? 2. What causes the variation that exists throughout the world? (weather, climate, etc) 3. What allows for organisms to survive in their environments? (ecosystems) 4. How do chemicals and nutrients move through systems and get recycled? 5. How do populations change and what impacts do these changes cause? 6. Can anything prevent or quicken population growth? 7. How does this all come together?

10. How are we impacting ecosystems and biodiversity? How can we live sustainably? *This section is a working document. As the course is taught activities and order can be changed with approval of all instructors.*	*Differentiated by having pictures for some students already* 8. Properties of water lab 9. Train through Maeklong Market video followed by population growth, carrying capacity and limiting factors. 10. Community interactions, symbiotic relationships, infographic for symbiotic relationships. predator prey graphing and limiting factors. 11. Invasive species PSA 12. Final Project: Create a product linking (community interaction) at least 1 organism from each category we learned about and 1 of the types of nutrient cycles. Explain the connections and the type of biome.	carbon among the hydrosphere, atmosphere, geosphere, and biosphere. 6. HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect the carrying capacity of ecosystems at different scales. 7. HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. 8. HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. HS-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. HS-ESS3-4. Evaluate or refine a technological solution that	Interdependent Relationships in Ecosystems LS2.B: Cycling of Matter and Energy Flow in Ecosystems PS3.D: Energy in Chemical Processes ETS1.B: Developing Possible Solutions CCC Cause and Effect Systems and System Models Energy and Matter Stability and Change 3. DCI PS3.D: Energy in Chemical Processes CCC Cause and Effect Systems and System Models Scale, Proportions and Quantity 4+5. DCI LS1.C: Organization for Matter and Energy Flow in Organisms LS2.A: Interdependent Relationships in Ecosystems LS2.B: Cycling of Matter and Energy Flow in Ecosystems CCC Cause and Effect	

		reduces impacts of human activities on natural systems. HS-ESS3-5. Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.	Systems and System Models Energy and Matter Stability and Change 6-8. DCI LS4.D: Biodiversity and Humans ETS1.B: Developing Possible Solutions ESS3.C: Human Impacts on Earth Systems ESS3.D: Global Climate Change CCC Cause and Effect Systems and System Models Stability and Change Scale, Proportions and Quantity	
Where we're going... (next unit lesson)	Evolution			

Unit 2: Evolution



Step 1: Identify Standards and Anchoring Phenomenon Connections

Grade and Subject	Grades 9-12 Sheltered ELL Biology	Unit Instructional Time	~ 6 weeks
Unit Title (Topic)	Evolution: Ch 16: Darwin's Theory of Evolution, Ch 17: Evolution of populations, Ch 18: Classification, Ch 19: History of Life		

1.a Select grade level NGSS Performance Expectations (PEs) or Topics, or district/state standards that build towards unit-based student learning goals.
For NJSLS/NGSS, PE color coding reflects 3-dimensional learning components. Search the Evidence Statements for details on what students should know and do.

HS-LS1: From Molecules to Organisms
HS-LS3: Heredity
HS-LS4: Biological Evolution
HS-ESS2: Earth's Systems

HS-LS3-2. Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
HS-LS4-2. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
HS-LS4-3. Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations.
HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.
HS-ESS2-7. Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.
HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

1.b Identify an anchoring phenomenon and related phenomena, problem, or project that corresponds to the selected PEs/standards, and is engaging and relevant to students. See more about phenomena and using phenomena with NGSS.

Phenomena: Science of Skin Color Why do humans have different colored skin?
Problem: If malaria is a deadly disease, why is the allele so prevalent in parts of the world? Also 60 minutes video Sickle Cell Anemia and heterozygous advantage Ivideo and lab).
Problem: What causes the changes in the rock pocket mice?
Peacock's Tail

1.c Describe an overview of how investigating the anchoring and related phenomenon, problem, or project through student-driven learning opportunities builds towards understanding of the PEs/standards. Revise, as needed, during unit development.

Why do humans have different colored skin? Through the process of learning about evolution, students will be able to link back to the phenomena of skin color. The ideas of fitness, variation, natural selection, adaptation, inheritance will all come together to allow students to truly understand why variation is important.

Rock Pocket Mouse Evolution: The rock pocket mouse video and questions will be presented later in the unit. The activities will allow students to use quantitative and qualitative data to describe environment puts selective pressure on phenotypes and how populations can change.

Heterozygous advantage and Sickle Cell Anemia: Through discussion and activities / labs students will be able to conclude that the benefit of the heterozygous genotype outweighs the cons to a homozygous recessive genotype (phenotype of sickle cell anemia) and why the allele frequency remains constant in certain areas.

1.d Unpack the 3-D learning components of the Performance Expectations/standards in the table below.

For NJSLS/NGSS guidance, see the NGSS Topic Arrangements and NGSS DCI Arrangements. Use tools to unpack each PE separately.

1.d.1. Science and Engineering Practices (SEP) (skills)	**1.d.2. Disciplinary Core Ideas (DCI) (content)**	**1.d.3. Crosscutting Concepts (CCC) (connections)**
Analyzing and Interpreting Data ● Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible.(HS-LS4-3) Engaging in Argument from Evidence ● Evaluate the evidence behind currently accepted explanations or solutions to determine the merits of arguments. (HS-LS4-5) Constructing Explanations and Designing Solutions ● Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS4-2),(HS-LS4-4)	LS4.A: Evidence of Common Ancestry and Diversity LS4.B: Natural Selection LS4.C: Adaptation ETS1.B: Developing Possible Solutions	Patterns Cause and Effect Connections to Nature and Science Systems and Models Stability and Change Structure and Function

1.e Determine students' prior knowledge about the lesson concepts. (e.g., pre-test, class discussion, exit ticket, 1-minute report, KWL chart, survey, etc.)

Evolution is one of the big ideas of biology. At the beginning of this unit students will be asked to brainstorm how the previous unit link to Evolution. Through small group and large class discussions, as well as completion of CER worksheets, misconceptions will be identified and prior knowledge will be assessed.

1.f Choose an instructional strategy that best suits teaching and learning about the anchoring phenomena, problem, or project.
For ideas, see the Instructional Strategies matrix.

Phenomena: Science of Skin Color - show the Ted Talk "The Science of Skin Color (teaching note: see additional activities in Evolution unit that will revisit this phenomena).
https://www.youtube.com/watch?time_continue=2&v=_r4c2NT4naQ
Human skin color can change in response to environmental changes (i.e. getting a sunburn or a suntan). However the root cause of our skin color is genetic and comes from our ancestors. UV radiation causes damage to the DNA in our cells and can lead to various forms of cancer. If your ancestors lived in an area that received large amounts of UV radiation (i.e. closer to the equator) humans evolved darker skin for protection through the process of natural selection. However light is also important since it allows humans to synthesize vitamin D. Therefore if your ancestors lived in an area that receives little light (i.e. near the poles) they evolved lighter skin.
Problem: If malaria is a deadly disease, why is the allele so prevalent in parts of the world?
Problem: What causes the changes in the rock pocket mice?

1.g Generate goals for a summative assessment to measure student learning toward the identified PEs and supporting SEPs, DCIs, and CCCs or standards and supporting skills, content, and connections. Revise, as needed, during unit development.

Darwin's Theory of Natural Selection

- Identify what Charles Darwin contributed to science.
- Explain the role of inherited variation in artificial selection.
- How does Darwin's theory explain the connection between living and extinct species?
- Describe how geographic distribution of species today relates to their evolutionary history.
- Identify how fossils help document the descent of modern species
- Describe how molecular biology can be used to trace the process of evolution.
- Explain how natural selection affects traits (various types of natural selection).
- Describe the types of isolation that lead to the formation of a new species.
- Explain a current hypothesis about the speciation of the Galapagos finches.
- Describe the goals of binomial nomenclature and taxonomy.
- Explain how species can be put into larger groups.
- State the goal of evolutionary classification.
- Describe what the tree of life illustrates.
- Identify what fossils reveal about ancient life.
- Explain how we date events in Earth's history.
- Explain how the history of life has been shaped by Earth's physical and biological environments.
- Name two patterns of macroevolution.
- Describe coevolution.
- Identify the speed of evolution.
- Explain what scientists hypothesized about early Earth and the origin of life.
- Explain the significance of sexual reproduction.

Unit 2: Evolution	
Academic Vocabulary:	Academic Syntax:
Evolution, Environment, Mutation, Evidence, Extinct, Geography, Population, Species, Variation, Inherit, Traits, Survive, Habitat, Natural Selection, Adaptation, Reproduce, Sexual Reproduciton, Genotype, Phenotype, Alleles, Fossils, Sedimentary, Layers, Homologous Structures, Analogous Structures, Vestigial Structures, Convergent Evolution, Divergent Evolution, Isolation, Artificial Selection	"Based on the evidence, I believe/predict/think…" "The data/evidence suggests…" "… was surprising because…" "At the end of the lab, I learned…" "First/Then/Next/After, I will…" "The cause of… was…" "The effect of…was…" "I believe… affected…" "The line graph represents…" "The differences between… and… are…" "The similarities between… and… are…" "The reason for… is…"



Unit Storyline

2.a List previous Performance Expectations/standards that support grade level expectations in figuring out the anchoring phenomenon.

HS-LS3-2. Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
HS-LS4-2. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
HS-LS4-3. Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations.
HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

HS-ESS2-7. Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.
HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

2.b Identify Unit Topics and Learning Goals: List main unit concepts related to grade level PEs/standards that support student learning goals in figuring out the anchoring phenomenon; revise as needed.

1. Darwin's Theory of Evolution
    a. Darwin's Voyage of Discovery
    b. Ideas that shaped Darwin's thinking
    c. The evidence that exists.
2. Evolutions of populations
    a. The Process of Speciation
3. History of Life
    a. The fossil record.
    b. Patterns and Processes of Evolution
    c. Earth's Earth History

2.c Select Unit Resources: Identify unit resources to develop lessons that address the PEs/standards and investigate the anchoring phenomenon through a variety of sequenced activities; revise as needed (include title and URL).

Science of skin color material, Ted Ed Science of skin color
cards for rock pocket mouse activity Modified Bio Rock Pocket Mouse Activity (additional materials can be found @ HHMI)
Grant study and Galapagos finches
Anole lizards anole video (short)
genes and variation worksheet(modified)
creating cladogram (to be done as a class)
candy phylogeny (mini group lab)
interpreting the fossil record
fossil index lab
Evolution in a big city video
Beak of the finch lab (no digital copy currently).
CER worksheet

Misconceptions about life on Earth (Evolution) From Scientific Argumentation in Biology pg 285.

Unit Storyline Template

The Storyline provides an overarching narrative and coherency between the series of lessons that comprise a unit. Copy and paste the Unit Storyline Template for each lesson in the unit. *A lesson may consist of one or more activities and take one or more days of instructional time.*

Driving Question… What we're investigating about the anchoring phenomenon	**Lesson Activities Sequence** (select from 2.c)	**Skills for Investigating the Driving Question (SEP)** (select from 1.d.1.)	**What We Figure Out About the Driving Question (DCI/CCC)** (select from 1.d.2 and 1.d.3.)	**New Questions & Next Steps** (build activity/lesson coherency)

1. How have the previous units built up for us to begin learning evolution? 2. How can we see evolution? 3. How did Darwin, and other scientists contribute to the Theory of Evolution? 4. What is some evidence of evolution? 5. How does variation occur and how does it link to evolution? 6. How does speciation occur? 7. How can we find order in diversity? 8. How can the fossil evidence help understand how life has changed? 9. What does the fossil record tell us about life on Earth? 10. How did it all begin?	1. Small group to large group work completing CER worksheets and discussing connections. (getting at prior knowledge) - Question: Why do humans have different skin colors? 2. The Science of skin color. Human skin Evidence for selection. 3. Notes and discussion of Darwin's journey and how he built upon other findings. Worksheets from textbook. 4. Comparing anatomy and development activities. Evidence for Evolution Lab activity. 5. Types of Natural selection and the Galapagos finches. Grant study and Galapagos finches (additionally can complete Rock pocket mouse activity) 6. Speciation of the Birds of Paradise video which leads to discussion on types of isolation and speciation. 7. Discussion of fossil record. fossil index lab HW: interpreting the fossil record 8. Evidence of evolution presentation: students pick an organism and	Analyzing and Interpreting Data ● Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible.(HS-LS4-3) Engaging in Argument from Evidence ● Evaluate the evidence behind currently accepted explanations or solutions to determine the merits of arguments. (HS-LS4-5) Constructing Explanations and Designing Solutions ● Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the	2-4 DCI: LS4.A: Evidence of Common Ancestry and Diversity LS.B:: Natural Selection ETS1.B: Developing Possible Solutions LS4.C: Adaptation ETS1.B: Developing Possible Solutions CCC: Patterns Cause and Effect Stability and Change Connections to Nature and Science Systems and models	1. Can we see evidence of evolution? 2. What did Darwin and other scientists contribute to the Theory of Evolution? 3. What evidence exists that supports the Theory of Evolution? 4. What causes the variations that lead to evolution? 5. How does variation lead to speciation? What else is needed? 6. With all of this variation and different species, how do we organize it all? 7. How can fossils help us understand life? 8. How did life on Earth begin and how has it changed? 9. How can we address misconceptions?

	give evidence that it has evolved over time.	assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS4-2),(HS-LS4-4)		
Where we're going... (next unit lesson)	Cells			

All activities can be modified if all instructors agree on replacement labs/projects etc.

Unit 3: Cells



Step 1: Identify Standards and Anchoring Phenomenon Connections

Grade and Subject	Grades 9-12 Sheltered ELL Biology	**Unit Instructional Time**	~8 weeks
Unit Title (Topic)	Unit 3: Cells Chapter 7 Cell Structure and Function, Chapter 8 Photosynthesis, Chapter 9 Cellular Respiration, Chapter 10 Cell Growth and Division		

1.a Select grade level NGSS Performance Expectations (PEs) or Topics, or district/state standards that build towards unit-based student learning goals.
For NGSS, PE color coding reflects 3-dimensional learning components. Search the Evidence Statements for details on what students should know and do.

HS-LS1: From Molecules to Organisms
HS-LS2: Ecosystems: Interactions, Energy, and Dynamics
HS-ETS1: Engineering Design
HS-ESS3: Earth and Human Activity

HS-LS1-1 Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
HS-LS1-2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-LS1-3 Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
HS-LS1-4 Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
HS-LS1-5 Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
HS-LS1-6 Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
HS-LS1-7 Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed which result in a net transfer of energy.
HS-LS2-4 Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem
HS-LS2-3 Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions
HS-LS2-5 Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere
HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants
HS-ESS3-4 Evaluate of refine a technological solution that reduces impacts of human activities on natural systems

1.b Identify an anchoring phenomenon and related phenomena, problem, or project that corresponds to the selected PEs/standards, and is engaging and relevant to students. See more about phenomena and using phenomena with NGSS.

The Immortal Cells of Henrietta Lacks (HS -LS1-2)
https://thewonderofscience.com/phenomenon/2018/7/8/the-immortal-cells-of-henrietta-lacks

1.c Describe an overview of how investigating the anchoring and related phenomenon, problem, or project through student-driven learning opportunities builds towards understanding of the PEs/standards. Revise, as needed, during unit development.

This story can be used to illustrate the role of cells in the proper functioning, growth, and reproduction of living organisms. It can also be used to explore ethics within scientific research.
Cells are the basic unit of life. Every cell is a living system that can grow and reproduce, capture and transform energy, and pass along genetic information. In this unit we will investigate the hierarchical organization of living things and how if one part of the system fails, homeostasis can fail. In addition students are also going to explore how proper cell division is important in maintaining complex organisms

1.d Unpack the 3-D learning components of the Performance Expectations/standards in the table below.
For NJSLS/NGSS guidance, see the NGSS Topic Arrangements and NGSS DCI Arrangements. Use tools to unpack each PE separately.

1.d.1. Science and Engineering Practices (SEP) (skills)	1.d.2. Disciplinary Core Ideas (DCI) (content)	1.d.3. Crosscutting Concepts (CCC) (connections)
Constructing explanations and Designing Solutions Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information	LS1.A: Structure and Function LS1.B: Growth and Development of Organisms LS1.C: Organization for Matter and Energy Flow in Organisms LS1.D: Information Processing LS2.B: Cycles of Matter and Energy Transfer in Ecosystems PS3.D: Energy in Chemical Processes ETS1.A: Defining and Delimiting Engineering Problems ETS1.B Developing possible solutions ETS1.C: Optimizing the Design Solution ESS2 C: Human Impacts on Earth System	Cause and Effect Scale, Proportion, Quantity Systems and System Models Energy and Matter Structure and Function

1.e Determine students' prior knowledge about the lesson concepts. (e.g., pre-test, class discussion, exit ticket, 1-minute report, KWL chart, survey, etc.)

Students should have prior knowledge about cell structure and function, cell reproduction, and the basic reactions of photosynthesis and cellular respiration from middle school life science. To better gauge where students are teachers can assign any combination of the following:

- 1-minute report on Cells (to be tailored to unit) (can also be turned into a GoogleForm)
- Cells KWL homework assignment.

1.f Choose an instructional strategy that best suits teaching and learning about the anchoring phenomena, problem, or project.
For ideas, see the Instructional Strategies matrix.

Problem: How does the proper functioning of a cell maintain the health of an organism and what happens when cell processes fail?

1.g Generate goals for a summative assessment to measure student learning toward the identified PEs and supporting SEPs, DCIs, and CCCs or standards and supporting skills, content, and connections. Revise, as needed, during unit development.
- Explain the main points of the cell theory - Explain how microscopes work. - Explain the functions of each of the four groups of macromolecules. - Explain what happens to chemical bonds during chemical reactions. - Explain the role enzymes play in living things and what affects their function. - Compare prokaryotic and eukaryotic cells. - Identify cellular structures that make and transport proteins and other macromolecules. - Distinguish the functions of vacuoles, lysosomes, and other macromolecules - Compare the roles of chloroplasts and mitochondria. - Describe the role of the cell membrane. - Explain how passive transport works. - Explain how active transport works. - Explain how single celled organisms maintain homeostasis. - Describe how cells of a multicellular organism work together to maintain homeostasis. - Describe why ATP is useful to cells. - Describe what happens during the process of photosynthesis. - Explain the role of pigments in the process of photosynthesis. - Identify the products and reactants of photosynthesis. - Identify how organisms get energy. - Explain how cellular respiration works. - Explain the relationship between photosynthesis and cellular respiration. - Describe some of the difficulties a cell faces as it increases in size. - Explain the role of chromosomes during cell division. - Compare cancer cells with other cells.

Unit 3: Cells	
Academic Vocabulary:	Academic Syntax:
Cell, Prokaryotic, Eukaryotic, Cell membrane, Plant Cell, Animal Cell, Function, Structure, Round, Square, Rough ER, Smooth ER, Nucleus, Ribosomes, Golgi Body, Vesicles, Vacuoles, Lysosomes, Chloroplasts, Mitochondria, Cilia, Flagella, Cytoplasm, Cell Wall, Nucleolus, Microscopes, Macromolecules, Carbohydrates, Proteins, Amino Acids, Lipids, Enzymes, ATP, Active Transport, Passive Transport, Homeostasis, Single-celled, Multicellular, Photosynthesis,	"Based on the evidence, I believe/predict/think…" "The data/results suggests…" "At the end of the lab, I learned…" "First/Then/Next/After, the cell…" "This visual represents…" "In my opinion, … is healthier/not healthier than…"

Pigment, Products, Reactants, Cellular Respiration, Energy, Chromosomes, Cell Division	"... has more/less [macromolecules] than…" "I agree/disagree with… because…" "I believe it is [photosynthesis/cellular respiration] because…" "...is important because…" "The differences between… and… are…" "The similarities between… and… are…" "...function is…" "... is useful because…" "... are the products/reactants of…" "... works by…" "A property/characteristic of… is…"



Step 2: Develop Unit Storyline

Create Coherent Learning Progression

Develop a unit storyline of a sequence of lessons that supports 3-dimensional learning and coherence for students to figure out the anchoring phenomenon.

1. Review previous grade level Performance Expectations (PEs)/standards.
2. List topics and concepts; then, select potential activities for the unit.
3. Copy and paste the Unit Storyline Template, one for each lesson in the unit, to create the lesson sequence framework.

Note: The Unit Storyline Templates will be used to guide detailed lesson plan development (Step 3).

2.a List previous Performance Expectations/standards that support grade level expectations in figuring out the anchoring phenomenon.

HS-LS1-1 Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
HS-LS1-2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-LS1-3 Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
HS-LS1-4 Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
HS-LS1-5 Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
HS-LS1-6 Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
HS-LS1-7 Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed which result in a net transfer of energy.
HS-LS2-3 Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions

HS-LS2-5 Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere

2.b Identify Unit Topics and Learning Goals: List main unit concepts related to grade level PEs/standards that support student learning goals in figuring out the anchoring phenomenon; revise as needed.

I. Cell Structure and Function
   A. Life is Cellular
   B. Cell Structure
   C. Molecules of Life
   D. Cell Transport
   E. Homeostasis and Cells

II. Photosynthesis
   A. Energy and life
   B. Photosynthesis: An Overview
   C. The Process of Photosynthesis

III. Cellular Respiration
   A. Cellular Respiration: An Overview
   B. The process of cellular respiration
   C. Fermentation

2.c Select Unit Resources: Identify unit resources to develop lessons that address the PEs/standards and investigate the anchoring phenomenon through a variety of sequenced activities; revise as needed (include title and URL).

(The POGILs listed below will accompany the Performance Expectations and can be used as classwork or homework)

Build a model cell (carolina lab)
Cell size and diffusion (carolina lab)
POGIL Prokaryotic and Eukaryotic Cells
POGIL Organelles in Eukaryotic Cells
POGIL Cell Size
POGIL Cell Size
POGIL- Cell Cycle
POGIL- Mitosis
POGIL- Meiosis
POGIL Photosynthesis and Respiration

Project: Cell Brochure (for structures and function)
Cell Structures and Microscope Lab (Cheek, Cork, Onion, Elodea)
Cell Membrane Bubble Lab (for understanding membrane structure and function)
Exercise BTB Lab
Cellular Respiration Lab with respirometers (no online copy)

HHMI Cell Cycle and Cancer VICE killing cancer HBO special Amoeba sisters Videos

Unit Storyline Template The Storyline provides an overarching narrative and coherency between the series of lessons that comprise a unit. Copy and paste the Unit Storyline Template for each lesson in the unit. *A lesson may consist of one or more activities and take one or more days of instructional time.*				
Driving Question… What we're investigating about the anchoring phenomenon	**Lesson Activities Sequence** (select from 2.c)	**Skills for Investigating the Driving Question (SEP)** (select from 1.d.1.)	**What We Figure Out About the Driving Question (DCI/CCC)** (select from 1.d.2 and 1.d.3.)	**New Questions & Next Steps** (build activity/lesson coherency)
1. What are the major structures of the cell? 2. How do cells differ? 3. How does the cell membrane maintain a boundary between the internal and external environment? 4. How are substances moved across the cell membrane? 5. Describe the transformation of energy that occurs during photosynthesis. 6. Describe the transformation of energy that occurs during cellular respiration? 7. What factors limit cell size?	1. Microscope Lab (hard copy only), along with viewing cork, cheek, and plant underneath the microscope 2. Project: Cell Brochure or some other cell project (for structures and function) 3.Cultural Food Project (identify macromolecules and calories) 4. Cell comparison Venn Diagram using images 5. Cell Membrane Bubble Lab (for understanding membrane structure and function) 6. Cell Transport Stop Motion Video 7. POGIL Photosynthesis and Respiration	Constructing explanations and Designing Solutions Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information	DCI for each driving question 1. LS1.A: Structure and Function 8. LS1.B: Growth and Development of Organisms 5-6 LS1.C: Organization for Matter and Energy Flow in Organisms 2-4 LS1.D: Information Processing 5-6 PS3.D: Energy in Chemical Processes 7, 9 ETS1.A: Defining and Delimiting Engineering Problems	How can cell division help us understand reproduction? What leads to genetic diversity? Why is it important to look for patterns in data? Looking at pea plants, what traits are shown in the plants in the photos?

8. What happens during each of the four phases of mitosis? 9. Why is cancer considered a disease of the cell cycle?	8. Exercise BTB Lab		7, 9, ETS1.B Developing possible solutions 7,9, ETS1.C: Optimizing the Design Solution 5,6 ESS2 C: Human Impacts on Earth System CCC for each driving question 6-9 Cause and Effect 1-3 Scale, Proportion, Quantity 1-3, 7-9 Systems and System Models 5-6 Energy and Matter 1-2 Structure and Function	
Where we're going... (next unit lesson)	Genetics			

Unit 4: Genetics

	**Standards and Anchoring Phenomenon Connections**		
Grade and Subject	Grades 9-12 Sheltered ELL Biology	**Unit Instructional Time**	~8 weeks
Unit Title (Topic)	Nature of Life: Chapter 11 Introduction to Genetics, Chapter 12 DNA, Chapter 13 RNA and Protein Synthesis, 14 Human Heredity, Chapter 15 Genetic Engineering		

1.a Select grade level NJSLS/NGSS Performance Expectations (PEs) or Topics, or district/state standards that build towards unit-based student learning goals.

HS-LS1: From Molecules to Organisms
HS-LS3: Heredity
HS-ETS1: Engineering Design

HS- LS1-1 Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
HS-LS3-1 Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
HS-LS3-2 Make and defend a claim based on evidence that inheritable genetic variations may result from : (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
HS-LS3-3 Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

1.b Identify an anchoring phenomenon and related phenomena, problem, or project that corresponds to the selected PEs/standards, and is engaging and relevant to students. See more about phenomena and using phenomena with NGSS.

Connect back to the science of skin color and why people have different skin tones.

1.c Describe an overview of how investigating the anchoring and related phenomenon, problem, or project through student-driven learning opportunities builds towards understanding of the PEs/standards. Revise, as needed, during unit development.

This video is a great way to transition from our previous topic on Cell Division and The Cell Cycle into Genetics. Students have already learned about how cancer can be the result of abnormal cell division, so they will have previous knowledge about how mutation can arise in a cell. This video is a great way to hook students to teach them how these mutations are the basis of genetics and genetic variation.

1.d Unpack the 3-D learning components of the Performance Expectations/standards in the table below.
For NGSS/NJSLS guidance, see the NGSS Topic Arrangements and NGSS DCI Arrangements. Use tools to unpack each PE separately.

1.d.1. Science and Engineering Practices (SEP) (skills)	**1.d.2. Disciplinary Core Ideas (DCI) (content)**	**1.d.3. Crosscutting Concepts (CCC) (connections)**
Asking questions and Defining Problems Engaging in Argument from Evidence Constructing Explanations and Designing Solutions	LS1.A: Structure and Function: All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins. LS1.B: Variation of Traits: Environmental factors also affect expression of traits, and hence affect the probability of occurrences on traits in a population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors LS1.B: Variation of Traits: Environmental factors also affect expression of traits, and hence affect the probability of occurrences on traits in a population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors LS1.A: Structure and Function: All cells contain genetic information in the form of DNA molecules. Genes are regions in the DA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells ETS1.A: Defining and Delimiting Engineering Problems ETS1.B Developing Possible Solutions ETS1.C Optimizing the Design Solution	Cause and Effect Scale, Proportion , Quantity Science is a Human Endeavor Structure and Function Systems and System Models Influence of Science, Engineering, and Technology on Society and the Natural World

1.e Determine students' prior knowledge about the lesson concepts. (e.g., pre-test, class discussion, exit ticket, 1-minute report, KWL chart, survey, etc.)		
Students have prior knowledge about genetics and basic punnett squares from middle school. In class we will discuss the following questions using a photo of any animal of their choice: 1. When you hear the word trait, what exactly comes to mind? 2. What are some traits you can observe on the animal in your picture? 3. Do the parents of this animal necessarily look exactly the same?		
1.f Choose an instructional strategy that best suits teaching and learning about the anchoring phenomena, problem, or project. For ideas, see the Instructional Strategies matrix.		
Problem based: Students solve a variety of punnett squares to understand inheritance and the different inheritance patterns to understand how skin color is passed down from parents to offspring. Phenomena based: Students will explore their own traits and determine their possible genotypes and phenotypes. Skin color is determined by multiple genes, but this would be a good place to discuss polygenes. Problem based: Students will watch a variety of videos on genetic modification. Students will debate on the ethics of genetic modification (GM). The BBC offers an overview of the topic, which starts by getting students to describe the GM process, and ends exploring some of the ethical issues around it. The resource includes prompts to trigger discussion, such as asking whether the process is like "playing god" and what uses genetic modification has been put to in medicine. We can then relate this back to genetic modification in humans and discuss the implications of this. Project based: In groups students can research other traits that are determined by environment like skin color and report out on their findings.		
1.g Generate goals for a summative assessment to measure student learning toward the identified PEs and supporting SEPs, DCIs, and CCCs or standards and supporting skills, content, and connections. Revise, as needed, during unit development.		
- Explain from where an organism gets its unique characteristics. - Explain how different forms of a gene are distributed to offspring. - Explain how probability can be used to predict inherited traits. - Describe the events that occur during each phase of meiosis. - Identify the differences between meiosis and mitosis - Describe the role of DNA in heredity - Identify the chemical components of DNA - Explain what the double-helix model shows about DNA - Explain how the cell makes RNA (transcription) - Discuss the process of transcription and translation - Describe how mutations change genetic information (traits). - Explain how mutations affect genes. - Describe how human karyotypes are used. - Explain the patterns of inheritance that human traits follow. - Explain the effects of errors in meiosis. - Describe the size of the human genome. - Describe how transgenic organisms are produced.		

- Explain how genetic engineering can benefit agriculture and industry.
- Explain how biotechnology can improve human health.

Unit 4: Genetics	
Academic Vocabulary:	Academic Syntax:
Genetics, Genes, Traits, Inheritance, Offspring, Heredity, DNA, Allele, Parents, Zygotes, Genome, Chromosomes, Characteristics, Genotype, Phenotype, Dominant, Recessive, Heterozygous, Homozygous, Punnett Square, Ratio, Percentage, Meiosis, Mitosis, Cell Division, Nitrogen Base, Phosphate, Deoxyribose Sugar, Nucleotide, Double Helix, Hydrogen Bond, Covalent Bond, Adenine, Thymine, Guanine, Cytosine, Base-Pair Rule, Antiparallel, DNA Replication, DNA Helicase, DNA Polymerase, DNA Ligase, Enzyme, Nucleus, Protein Synthesis, RNA, Uracil, Single Strand, Ribose, Ribosomes, Cytoplasm, mRNA, Transcription, Translation, tRNA, Amino Acids, RNA Polymerase, Codon, Anticodon, Codon Wheel, Protein, Genetic Engineering, Biotechnology, Mutations, Substitution, Silent Mutation, Nonsense Mutation, Missense Mutation, Frameshift Mutation, Insertion, Deletion	"Based on the evidence, I believe/predict/think…" "The data/results suggests…" "At the end of the lab, I learned…" "First/Then/Next/After,…" "This visual represents…" "Another example is…" "In my opinion, genetic engineering…" "I agree/disagree with… because…" "Do you agree?" "… is more/less likely/probable because…" "…is important because…" "The differences between… and… are…" "The similarities between… and… are…" "…function is…" "… is useful because…" "… works by…" "A property/characteristic of… is…" "A pro/con is…"



Step 2: Develop Unit Storyline

Create Coherent Learning Progression

Develop a unit storyline of a sequence of lessons that supports 3-dimensional learning and coherence for students to figure out the anchoring phenomenon.

1. Review previous grade level Performance Expectations (PEs)/standards.
2. List topics and concepts; then, select potential activities for the unit.

3. Copy and paste the Unit Storyline Template, one for each lesson in the unit, to create the lesson sequence framework.

Note: The Unit Storyline Templates will be used to guide detailed lesson plan development (Step 3).

2.a List previous Performance Expectations/standards that support grade level expectations in figuring out the anchoring phenomenon.

HS- LS1-1 Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.

HS-LS3-1 Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

HS-LS3-2 Make and defend a claim based on evidence that inheritable genetic variations may result from : (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

HS-LS3-3 Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

2.b Identify Unit Topics and Learning Goals: List main unit concepts related to grade level PEs/standards that support student learning goals in figuring out the anchoring phenomenon; revise as needed.

I. Introduction to Genetics
   - A. The Work of Gregor Mendel
   - B. Applying Mendel's Principles
   - C. Other Patterns of Inheritance
   - D. Meiosis - review from cells if necessary

II. DNA
   - A. Identifying the Substance of Genes
   - B. The Structure of DNA
   - C. DNA Replication

III. RNA and Protein Synthesis
   - A. RNA
   - B. Ribosomes and Protein Synthesis
   - C. Gene Regulation and Expression
   - D. Mutations

IV. Human Heredity
   - A. Human Chromosomes
   - B. Human Genetic Disorders
   - C. Studying the Human Genome

V. Biotechnology

A. The process of genetic engineering

2.c Select Unit Resources: Identify unit resources to develop lessons that address the PEs/standards and investigate the anchoring phenomenon through a variety of sequenced activities; revise as needed (include title and URL).

Genetics Cross Packet

Dragon Genetics & Extension Activity (Genetics Review)

Meiosis Pogil (first few pages)

Activity from the Miller and Levine Biology Book - pg 395. Have students create an illustration showing the movement of chromosomes for an organism with three chromosomes. Have them exchange illustrations with a partner to check for revision. (To Supplement Chapter 12- Introduction to Genetics and Meiosis)

Growing More and Better Corn Project from Miller and Levine Biology Book - pg 404-405. (To summarize concepts in Chapter 12)

POGIL-DNA Structure and Replication (to go with Chapter 13- DNA)

Cracking Your Genetic Code- Movie (to go with Chapter 13)

Building a DNA Molecule

Strawberry DNA extraction

An Eight-Hour Task: How Does DNA Replicate So Quickly? (From Miller and Levine Biology 2019 Book pg 432-433)

Transcription and Translation Coloring (Chapter 14)

Transcription and Translation Lab (No electronic copy)

HHMI- DNA and Mutations

Magnetic Karyotype Activity (Chapter 15) (No electronic copy- Carolina Chromosome Kit)

Human Genetic Disorders Project (To supplement Chapter 15- The Human Genome)

Gel Electrophoresis Lab

Gene expression around the world activity.

Ice cream sundae gene expression introductory activity

Videos on sickle cell, gene editing, etc.

GATTACA film and discussion

Unit Storyline Template

The Storyline provides an overarching narrative and coherency between the series of lessons that comprise a unit. Copy and paste the Unit Storyline Template for each lesson in the unit. *A lesson may consist of one or more activities and take one or more days of instructional time.*

Driving Question… What we're investigating about the anchoring phenomenon	**Lesson Activities Sequence** (select from 2.c)	**Skills for Investigating the Driving Question (SEP)** (select from 1.d.1.)	**What We Figure Out About the Driving Question (DCI/CCC)** (select from 1.d.2 and 1.d.3.)	**New Questions & Next Steps** (build activity/lesson coherency)
1. What factors influence typical inheritance ? 2. How does meiosis change a diploid cell into haploid gametes? 3. How can understanding Mendelian Genetics be applied to real world scenarios such as crop production? 4. What is the structure of DNA and how does this relate to its function? 5. How does DNA replicate and what happens when a mistake is made? 6. How does DNA have the code to build a protein?	1. Genetics Cross Packet 2. Human Inheritance lab 3. Growing More and Better Corn Project from Miller and Levine Biology Book - pg 404-405. 4. POGIL-DNA Structure and Replication (to go with Chapter 13- DNA) 5. Building a DNA Molecule 6. Gene Expression Ice cream sundae introduction. Transcription and Translation Coloring (Chapter 14) 7. Replication, Transcription and Translation Project: Create a video or poster distinguishing between all three processes.	1. Asking questions and Defining Problems 2. Asking questions and Defining Problems 3. Constructing Explanations and Designing Solutions 4. Asking Questions and Defining Problems 5. Asking Questions and Defining Problems and Constructing Explanations and Designing Solutions 6. Asking Questions and Defining Problems and Constructing Explanations and Designing Solutions 7. Asking Questions and Defining Problems	DCI 1,2,4-6 LS1.A: Structure and Function: All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins. 3-7 LS1.B: Variation of Traits: Environmental factors also affect expression of traits, and hence affect the probability of occurrences on traits in a population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors 1-7 LS1.A: Structure and Function: All cells contain genetic information in the	How are genetic mutations the basis for evolution? How can our anchoring phenomenon be linked to evolution? (Skin color basis)

(Transcription and Translation) 7. What are the different types of mutations and what are their effects? 8. What information can we get from a karyotype? 9. How can human genetic disorders be diagnosed and treated? 10. How can we use biotechnology in the medical and agricultural field? What are the implications?	7. HHMI- DNA and Mutations 8. Carolina Human Karyotype Lab (no electronic copy) 9. Human Genetic Disorders Project - needs modification 10. Gel Electrophoresis Lab	8. Asking Questions and Defining Problems and Constructing Explanations and Designing Solutions 9. Constructing Explanations and Engaging in Argument from Evidence 10. Constructing Explanations and Engaging in Argument from Evidence	form of DNA molecules. Genes are regions in the DA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells 8-10 ETS1.A: Defining and Delimiting Engineering Problems 8-10 ETS1.B Developing Possible Solutions 8-10 ETS1.C Optimizing the Design Solution CCC 1-10 Cause and Effect 1-10 Scale, Proportion , Quantity 9-10 Science is a Human Endeavor 1-7 Structure and Function 9-10 Systems and System Models 10	

			Influence of Science, Engineering, and Technology on Society and the Natural World	
Where we're going... (next unit lesson)	Diversity of Life			

Unit 5: Diversity of Life



Step 1: Identify Standards and Anchoring Phenomenon Connections

Grade and Subject	Grades 9-12 Sheltered ELL Biology	**Unit Instructional Time**	~ 4 weeks
Unit Title (Topic)	Unit 5: Diversity of Life, Chapter 20: Viruses, Prokaryotes, Protists, and Fungus		

1.a Select grade level NGSS Performance Expectations (PEs) or Topics, or district/state standards that build towards unit-based student learning goals.
For NGSS, PE color coding reflects 3-dimensional learning components. Search the Evidence Statements for details on what students should know and do.

HS-LS1: From Molecules to Organisms
HS-LS4: Biological Evolution
HS-ETS1: Engineering Design

HS-LS1-1. Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells.
HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms
HS-LS1-3 Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
HS-LS4-1 Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

1.b Identify an anchoring phenomenon and related phenomena, problem, or project that corresponds to the selected PEs/standards, and is engaging and relevant to students. See more about phenomena and using phenomena with NGSS.

Phenomena: Virus Hunter: Monitoring Nipah Virus in Bat Populations Virus Hunter- HHMI
Problem: How does a virus infect cells? NPR- Flu Virus Attacks!
Problem: Preventing the next epidemic- How can we prevent epidemics (Case Study from Miller and Levine Biology book page 681_

1.c Describe an overview of how investigating the anchoring and related phenomenon, problem, or project through student-driven learning opportunities builds towards understanding of the PEs/standards. Revise, as needed, during unit development.

Virus Hunter: This video follows scientists working in Bangladesh as they test fruit bat populations to determine whether they are infected with Nipah virus, a potentially deadly human pathogen. This video along with supplemental materials will introduce viral infections, how they are detected, prevented, tracked, and treated. They will also practice calculations and make claims about the spread of the virus throughout Malaysia.
How does a virus infect cells? : Through a well broken down visual, students will learn how viruses infect, reproduce, and make you sick. This will further help them understand viral reproduction and ultimately how scientists are working to prevent viruses and use them in immunotherapy.

Case Study- Preventing the Next Epidemic: Each lesson throughout the chapter explores a different group of microbes. Representatives from each of these groups can either be beneficial or detrimental to humans and the biosphere. Through this case study, students explore a real-world example of impacts to human health and understanding how disease - causing organisms help us control them and prevent future epidemics.

1.d Unpack the 3-D learning components of the Performance Expectations/standards in the table below.
For NGSS/NJSTS guidance, see the NGSS Topic Arrangements and NGSS DCI Arrangements. Use tools to unpack each PE separately.

1.d.1. Science and Engineering Practices (SEP) (skills)	1.d.2. Disciplinary Core Ideas (DCI) (content)	1.d.3. Crosscutting Concepts (CCC) (connections)
Analyzing and Interpreting Data ● Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible. Engaging in Argument from Evidence ● Evaluate the evidence behind currently accepted explanations or solutions to determine the merits of arguments. Constructing Explanations and Designing Solutions ● Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (Planning and Carrying out Investigations	LS1.A: Structure and Function LS1.B: Growth and Development of Organisms LS1.C: Organization for Matter and Energy Flow in Organisms LS4.A: Evidence of Common Ancestry and Diversity LS4.C: Adaptation ETS1.A Defining and Delimiting Engineering Problems ETS1.B Developing Possible Solutions ETS1.C Optimizing the Design Solution	Cause and Effect Systems and SYstem Models Stability and Change Structure and Function

1.e Determine students' prior knowledge about the lesson concepts. (e.g., pre-test, class discussion, exit ticket, 1-minute report, KWL chart, survey, etc.)

This is a relatively new area for students as they have not learned much about the Diversity of Life, but to get an idea of what they do know from previous chapters about cells, living organisms, and evolution, students will create a KWL chart for each of the following groups: Bacteria/Viruses, Protists, Fungus, Plants, and Animals. After creating this, they will then compare each group- what are some similarities that they share? What are some differences?

1.f Choose an instructional strategy that best suits teaching and learning about the anchoring phenomena, problem, or project.
For ideas, see the Instructional Strategies matrix.

Phenomena: Virus Hunter: Epidemiology of Nipah Virus
Problem: How do viruses infect cells?
Problem: Case study. How Can We Prevent the Next Epidemic?

1.g Generate goals for a summative assessment to measure student learning toward the identified PEs and supporting SEPs, DCIs, and CCCs or standards and supporting skills, content, and connections. Revise, as needed, during unit development.

- How do viruses reproduce?
- Describe what happens after a virus infects a cell.
- Explain how viruses cause disease.
- Clarify whether a virus is a living thing.
- Explain how prokaryotes are classified.
- Describe how prokaryotes vary in their structure and function.
- Depict the roles of prokaryotes in the living world.
- Describe how bacteria can cause disease.
- Define emerging diseases
- Explain how protists are classified
- Describe how protists move and reproduce.
- Explain the roles that protists play in the environment
- Identify the basic characteristics of fungi
- Describe how fungi affect homeostasis in other organisms and the environment.

Unit 5: Diversity of Life	
Academic Vocabulary:	Academic Syntax:
Diversity of Life, Biodiversity, Environment, Habitat, Invertebrates, Vertebrates, Mammals, Viruses, Abiotic, Infection, Pathogens, Vaccines, Antibiotics, Treatments, Disease, Prokaryotes, Structure, Function, Bacteria, Protists, Fungi, Decomposers, Homeostasis, Epidemic, Epidemiology	"This organism is…" "The differences between… and… are…" "The similarities between… and… are…" "Based on the evidence, I believe/predict/think…"

	"The data/results suggests/support my concussion because…" "At the end of the lab, I learned…" "First/Then/Next/After,…" "This visual represents…" "Another example is…" "In my opinion,…" "I agree/disagree with… because…" "The article/resource says…" "… is more/less likely/probable because…" "…is important because…" "…function is…" "A property/characteristic of… is…" "A pro/con is…" "The cause of… was…" "The effect of…was…" "I believe… affected…" "The purpose is to teach the audience about…" "The call-to-action is…" "The problem can be solved by…"



Unit Storyline

2.a List previous Performance Expectations/standards that support grade level expectations in figuring out the anchoring phenomenon.

HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms
HS-LS1-3 Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
HS-LS4-1 Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
HS-LS4-6 Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.
HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

2.b Identify Unit Topics and Learning Goals: List main unit concepts related to grade level PEs/standards that support student learning goals in figuring out the anchoring phenomenon; revise as needed.

I. Viruses, Prokaryotes, Protists, and Fungus
- Viruses
  - What is a Virus?
  - Viral Infections
  - Viral Diseases
  - Viruses and Cells
- Prokaryotes
  - What are prokaryotes?
  - Structure and function of prokaryotes
  - Prokaryotes in the environment
  - Bacterial Diseases
  - Emerging Diseases
- Protists
  - What are protists?
  - Structure and function of protists
  - Protists in the environment

2.c Select Unit Resources: Identify unit resources to develop lessons that address the PEs/standards and investigate the anchoring phenomenon through a variety of sequenced activities; revise as needed (include title and URL).

1. Flu Virus Attacks- NPR video
2. POGIL- The Spread of Pathogens
3. Vaccines- Calling the Shots (PBS)
4. Lab- Where Can We Find Bacteria?
5. Students will conduct research on a pathogen that benefits human health or the environment. Students will also create a project Infectious Disease Project

6. Lab-Investigating Pond Water (no electronic copy)

7. Students research and investigate one specific protist and share out about its role in the environment

8. Exploration Lab from Miller and Levine Biology (pg 705)- Mushroom Farming

9. From Miller and Levine Book pg 714: Cholera in Haiti, Managing a Crisis

Unit Storyline Template

The Storyline provides an overarching narrative and coherency between the series of lessons that comprise a unit. Copy and paste the Unit Storyline Template for each lesson in the unit. *A lesson may consist of one or more activities and take one or more days of instructional time.*

Driving Question… What we're investigating about the anchoring phenomenon	**Lesson Activities Sequence** (select from 2.c)	**Skills for Investigating the Driving Question (SEP)** (select from 1.d.1.)	**What We Figure Out About the Driving Question (DCI/CCC)** (select from 1.d.2 and 1.d.3.)	**New Questions & Next Steps** (build activity/lesson coherency)

1. How do viruses reproduce and how does their structure facilitate the spread of disease? 2. How are pathogens spread? 3. How do vaccines prevent disease? 4. Where can bacteria be found? 5. How can certain pathogens be helpful/harmful? 6. Where can protists be found and how are they classified? 7. What roles do protists play in the environment? 8. What are the roles that fungus plays in the environment? 9. How can a global crisis be managed when it comes to disease?	1. Flu Virus Attacks- NPR video 2. POGIL- The Spread of Pathogens 3. Vaccines- Calling the Shots (PBS) 4. Lab- Where Can We Find Bacteria? 5. Students will conduct research on a pathogen that benefits human health or the environment. Students will also create a project Infectious Disease Project 6. Lab-Investigating Pond Water (no electronic copy) 7. Students research and investigate one specific protist and share out about its role in the environment 8. Exploration Lab from Miller and Levine Biology (pg 705)- Mushroom Farming 9. From Miller and Levine Book pg 714:	Analyzing and Interpreting Data ● Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible. Engaging in Argument from Evidence ● Evaluate the evidence behind currently accepted explanations or solutions to determine the merits of arguments. Constructing Explanations and Designing Solutions ● Construct an explanation	LS1.A: Structure and Function (1, 11, 12, 13) LS1.B: Growth and Development of Organisms (11, 12, 13) LS1.C: Organization for Matter and Energy Flow in Organisms (11-15) LS2.C: Ecosystem Dynamics, Functioning, and Resilience(7,8,9, 14) LS4.A: Evidence of Common Ancestry and Diversity(6-9) LS4.C: Adaptation(6-9) LS4.D: Biodiversity and Humans (5, 7, 9) ETS1.A Defining and Delimiting Engineering Problems (5, 7, 9) ETS1.B Developing Possible Solutions(1, 9, ETS1.C Optimizing the Design Solution (1, 9,)	1. How can what we learned about the diversity of life be tied back into genetics and evolution? 2. Why is having an understanding of molecular biology important in understanding the diversity of life? 3. Why is it important to preserve biodiversity? What will happen if we don't?

	Cholera in Haiti, Managing a Crisis pg 750- How did plants conquer the land?	based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (Planning and Carrying out Investigations	CCC Cause and Effect (All) Systems and System Models (1-5, 8-9,) Stability and Change (all) Structure and Function (1, 2)	
Where we're going... (next unit lesson)				

All Unit Storyline templates and all activities / labs can be modified upon agreement of all instructors as the curriculum is being implemented.

Career-Ready Practices

CRP1: Act as a responsible and contributing citizen and employee.
CRP2: Apply appropriate academic and technical skills.
CRP3: Attend to personal health and financial well-being.
CRP4: Communicate clearly and effectively and with reason.
CRP5: Consider the environmental, social and economic impacts of decisions.
CRP6: Demonstrate creativity and innovation.
CRP7: Employ valid and reliable research strategies.
CRP8: Utilize critical thinking to make sense of problems and persevere in solving them.
CRP9: Model integrity, ethical leadership and effective management.
CRP10: Plan education and career paths aligned to personal goals.
CRP11:. Use technology to enhance productivity.
CRP12: Work productively in teams while using cultural global competence.

Supports for English Language Learners:

Sensory Supports	Graphic Supports	Interactive Supports
Real-life objects (realia)	Charts	In pairs or partners
Manipulatives	Graphic organizers	In triads or small groups
Pictures & photographs	Tables	In a whole group
Illustrations, diagrams, & drawings	Graphs	Using cooperative group structures
Magazines & newspapers	Timelines	With the Internet (websites) or software programs
Physical activities	Number lines	In the home language
Videos & films		With mentors
Broadcasts		
Models & figures		

from https://wida.wisc.edu

Differentiation Strategies:

Accommodations	Interventions	Modifications
Allow for verbal responses	Multi-sensory techniques	Modified tasks/ expectations
Repeat/confirm directions	Increase task structure (e.g., directions, checks for understanding, feedback)	Differentiated materials
Permit response provided via computer or electronic device	Increase opportunities to engage in active academic responding (e.g., writing, reading aloud, answering questions in class)	Individualized assessment tools based on student need
Audio Books	Utilize prereading strategies and activities: previews, anticipatory guides, and semantic mapping	Modified assessment grading